Question1:(35Marks) Write Computer Programs that do the followings:

1. Solve the Quadratic Equation ax^2 + bx + c = 0. [5Marks]
2. Find the factorial for a given number. [6Marks]
3. Find the prime numbers between two limits a & b [9Marks]
4. Sort a set of numbers in an ascending order. [9Marks]
5. Find a number that leaves a remainder of 1 when divided by 2, 3,4, 5, or 6 but is evenly divisible by 7. [6Marks]

Question2:(20 Marks)

1. Design a Computer program to plot the crank-slider mechanism shown in figure (1). [8Marks]
2. Design a Computer program to find the Lagrange polynomial interpolation for the points in the table below; and to plot the resulting equation. [12Marks]

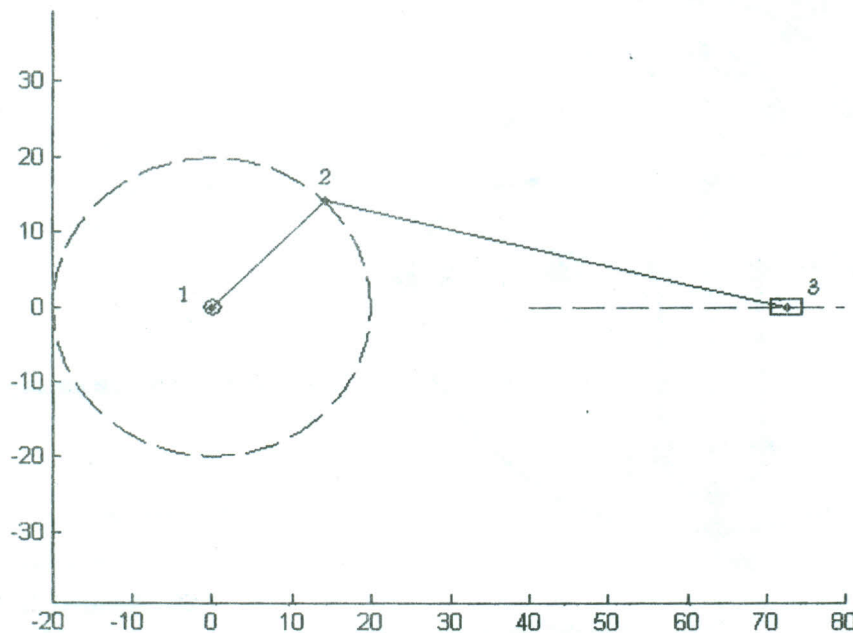| X	0	1	2	2	3	4	5
y	0	2	4	7	18	27	60

Figure (1)

Question3:(20 Marks)

Using figure (2), design a computer program to solve Merchant's Circle problem.

Inputs will be: Cutting Force (F_c), Tangential Force (F_t), Cutting Ratio (r), and Rake Angle (α).

Outputs should be: Shear Angle (ϕ), Shear Force (F_s), Friction Force (F), Normal-to-Friction Force (N), Normal-to-Shear Force (F_n), Resultant Force (R), Coefficient of Friction (μ), and Friction Angle (τ).
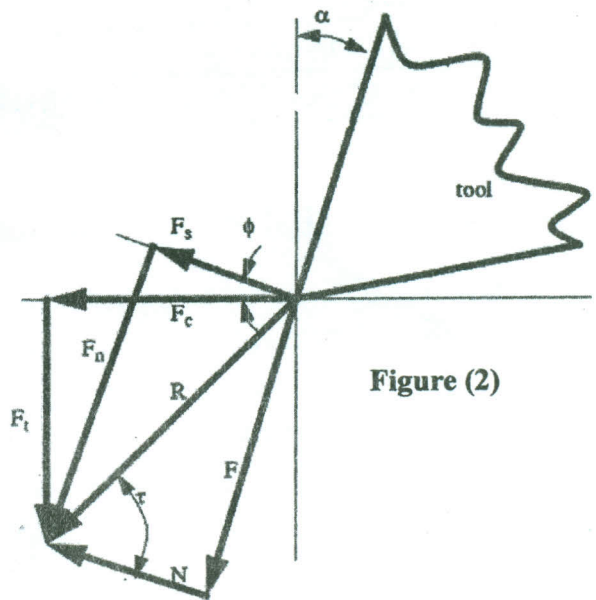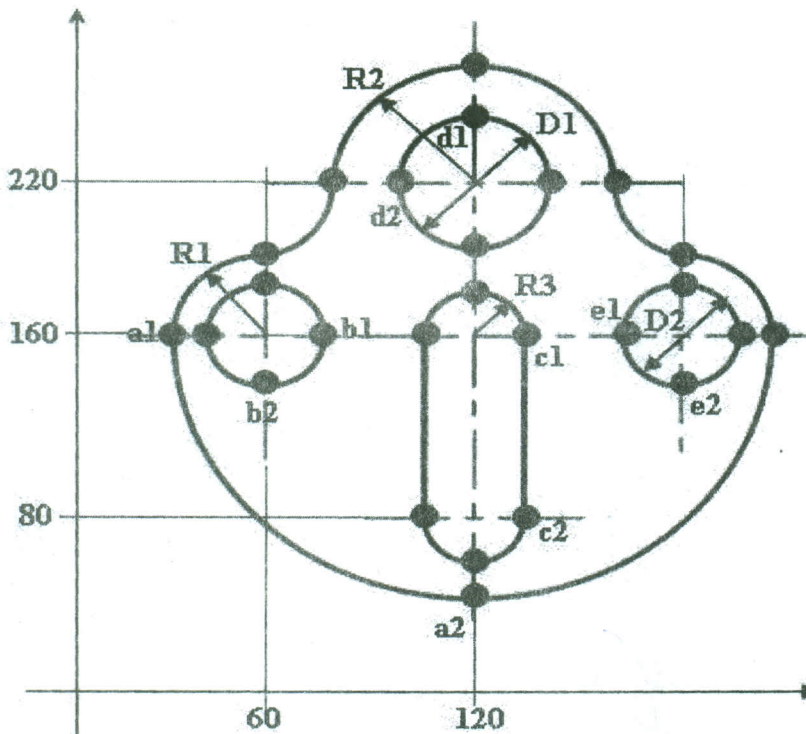

Figure (2)

Question4:(25 Marks)

Using Metric Programming System, write a computer program for an CNC Milling Machine to produce the **symmetrical** part shown in figure (3). The depth of cut is 3mm, the speed is 400 rpm, and the feed is 120 mm/min.

First make a program using the absolute system, then write another program using the incremental system. Start with points a1, a2,…, then b1, b2,…, then c1, c2,…, etc.

| D1= 50 |
| D2= 40 |
| R1= 30 |
| R2= 45 |
| R3= 15 |

Dimensions are in mm

Questions are over…..

Good Luck,

Dr. Ahmed Galal

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Figure (3)